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(21) International Application Number: PCT/US99/21805 (22) International Filing Date: 17 September 1999 (17.09.99) (30) Priority Data: 60/100,765 17 September 1998 (17.09.98) US (71) Applicant: INNOVATIVE COATINGS CORPORATION [US/US]; Suite 200, 3350 West Town Point Drive, Kennesaw, GA 30114 (US). (72) Inventors: PHILLIPS, Jerry, S.; 3064 Intrepid Wake, Marietta, GA 30062 (US). BROWN, David, W.; 108 Wiltshire Drive, Oak Ridge, TN 37830 (US). BEAN, Wayne; 2240 Hill Creek Way, Marietta, GA 30062 (US). SIGLER, Donald, H., Jr.; 2100 Four Mile Drive, Kalispell, MT 59901 (US). (74) Agents: WITHERS, James, D. et al.; Jones & Askew, LLP, 2400 Monarch Tower, 3424 Peachtree Road, Atlanta, GA 30326 (US).		(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>Without international search report and to be republished upon receipt of that report.</i>
(54) Title: NOVEL PALLETS (57) Abstract The present invention is a novel pallet comprising conventional pallet coated with an elastomeric material, such as a polyurea. The present invention is further directed to a novel composite pallet comprising an elastomeric material, such as a polyurea, and one or more filler materials.		

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NOVEL PALLETS

CROSS-REFERENCE TO RELATED APPLICATIONS

15 This application claims the benefit of the U.S. Provisional Application No. 60/100,765, filed September 17, 1998.

TECHNICAL FIELD

20 The present invention is in the field of storage pallets for storing and transporting a wide variety of goods. More specifically, the present invention relates to coating a conventional pallet so that it can be used for storage or transportation support.

BACKGROUND OF THE INVENTION

25 Conventional pallets are used internationally for storing and transporting a wide variety of goods. Most wooden pallets have a life expectancy of about six months before they have to be repaired or discarded. This is a relatively large expense and a time consuming process.

30 What is needed is a pallet for storing or transporting goods that is resistant to damage and has a long life expectancy.

SUMMARY OF THE INVENTION

35 The present invention addresses the foregoing problems with conventional pallets by providing a system that is waterproof and is highly durable. The present invention is directed to a novel pallet that is comprised, for example, of wood that is coated with a fast-curing elastomeric material using spray techniques whereby a homogeneous, non-porous, and monolithic coating is formed. The pallet of the present invention is waterproof and is highly resistant to damage. The present invention also includes a method for manufacturing a pallet comprising

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5 spraying or otherwise administering an elastomeric material, preferably a polyurea, to a conventional pallet thereby producing a coated pallet that is durable, has a long life expectancy and requires a minimum of maintenance.

10 The present invention is further directed to a composite pallet comprising one or more components, wherein each component comprises one or more polymeric materials optionally filled with one or more filler materials. The composite pallets of the present invention are waterproof and highly resistant to damage. To increase the water-resistance and damage-resistance of the composite pallets of the present invention, the
15 composite pallets may be coated with a fast-curing elastomeric material, such as a polyurea coating.

 Accordingly, it is an object of the present invention to provide a pallet that is waterproof, resistant to impact, and will remain functional for a long period of time.

20 It is a further object of the present invention to provide a pallet that can be used in the food and/or drug industry.

 These and other features and advantages of the present invention will become apparent after a review of the following detailed description of the disclosed embodiments.

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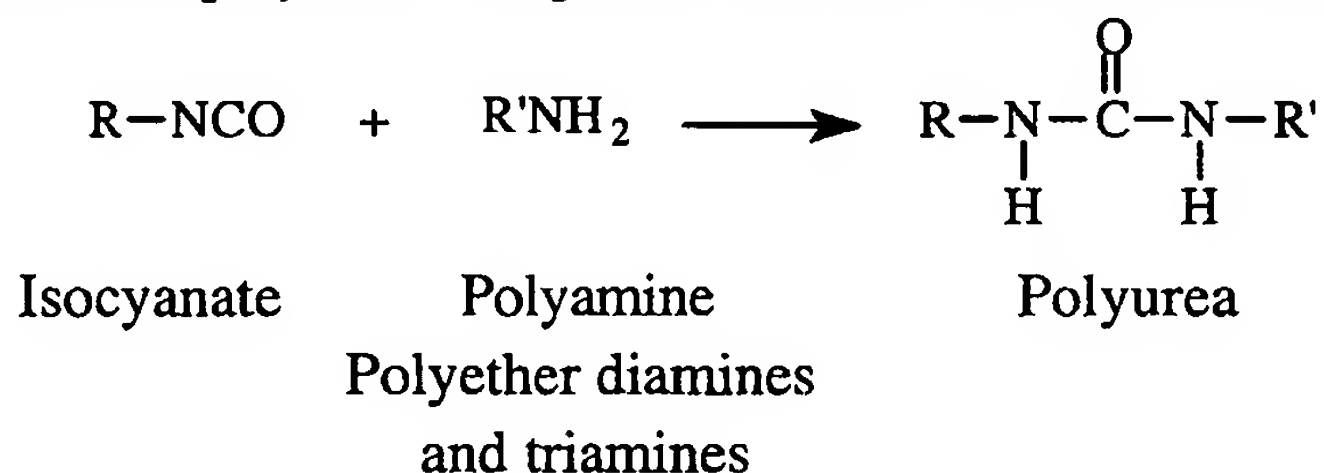
DETAILED DESCRIPTION OF THE INVENTION

 The present invention is directed to a pallet that is comprised of a conventional pallet coated with a fast-curing elastomeric material using spray techniques whereby a homogeneous, non-porous, and
30 monolithic coating is formed. The desired elastomeric materials used in the present invention are prepared by initiating the reaction of an aliphatic or aromatic isocyanate-terminated compound or polymer with an aliphatic or aromatic amine-terminated compound or polymer immediately before applying the elastomeric material to the surface to be coated. Desirably,
35 the reactive components (i.e., isocyanate-containing and amine-containing materials) are mixed directly in a spray gun used to apply the elastomeric material. The thickness of the elastomeric coating can easily be controlled by conventional application means. It is important that the thickness of the elastomeric coating be enough so that the coating is resistant to impact
40 that is normal in use. The desired thickness of the elastomeric coating on

5 the pallet material is between approximately 1 mil and 250 mils, with the most desired thickness of between 60 mils and 75 mils. The present invention also includes a method of manufacturing a pallet comprising spraying a conventional pallet with an elastomeric material on the surface of the pallet so that the resulting device is substantially impermeable to
10 water and is resistant to impact.

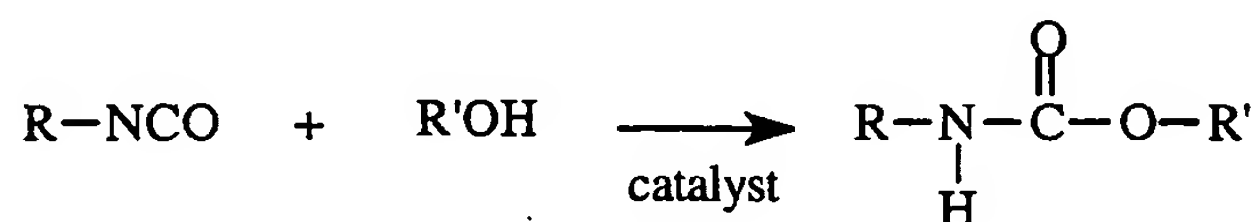
It is to be understood that the term "conventional pallets" means any pallet that is made of wood or compressed wood, and is rigid and strong enough to be used as a support for goods.

15 The elastomeric material that is applied to the conventional pallet includes, but is not limited to, polyurea, polyurethane, polyaspartics, epoxy, polyurethane-polyurea hybrids or other similar polymer. Desirably, the polymer is polyurea. Polyureas are typically supplied in monomer form as two solutions. One solution is an isocyanate and the second solution is a polyamine. The resulting polymer after mixing the two
20 components is a polyurea. The general reaction is shown as follows:



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Another desired polymer is polyurethane which is supplied as two components, an isocyanate and a polyether or polyester polyol. The two solutions are mixed immediately before application to a conventional pallet as shown in Examples 1 and 2 herein. The polyurethane system
30 requires the use of a catalyst, such as an organotin compound, i.e., dibutyl tin dilaurate. The general reaction for the production of a polyurethane polymer is as follows:

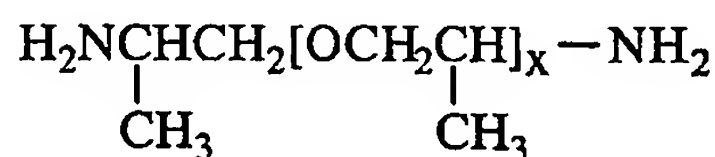


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5 Isocyanate Polyether Polyurethane
 Polyol

10 For the application of polyurea to a conventional pallet, a
 polyether polyamine is mixed with the isocyanate immediately before the
 application of the mixture. The mixing of the two components is typically
 done in a spray gun and the mixture is sprayed onto the conventional
 pallet. Polyurea is the desired coating because the formation of the
 polymer does not require a catalyst and the reaction is relatively
 temperature insensitive as well as relatively insensitive to water and
 15 humidity. Also, since polyurea has no volatile organic compounds
 (VOC's), the utilization of polyurea does not cause any EPA problems for
 the applicator or detriment to the conventional pallets.

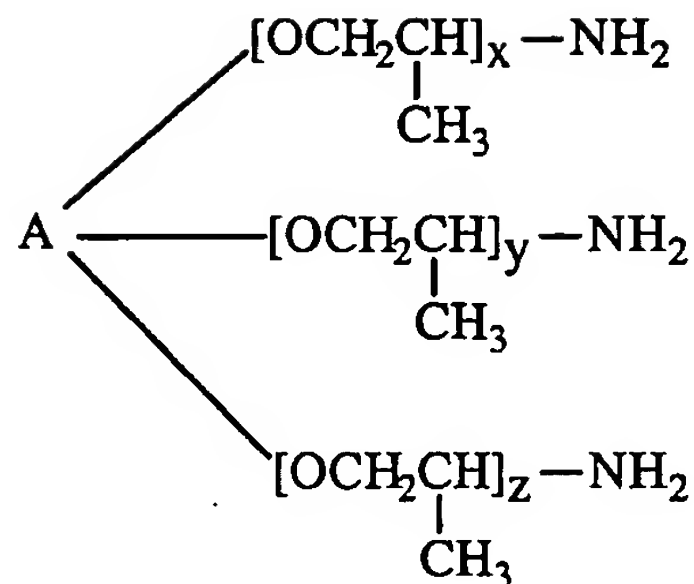
20 Polyamines that can be used in practicing the present
 invention include, but are not limited to, Jeffamine® D2000 (Huntsman
 Corp., Houston, TX), which are amine-terminated polypropylene glycols
 having the following general structure:



25 wherein x averages about 33 and the molecular weight is about 2000;
 Jeffamine® T5000 (Huntsman Corp., Houston, TX), which are amine-
 terminated polypropylene glycols having the following general structure:

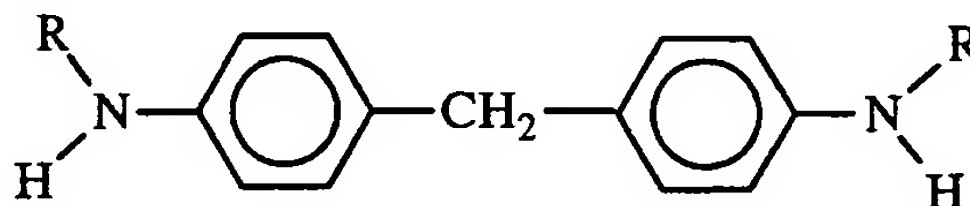
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wherein A represents glycerine and the molecular weight is about 5000; Ethacure® 100 (Albemarle Corporation, Baton Rouge, LA), which is diethyltoluenediamine; and Unilink® 4200 (UOP, Des Plaines, IL) which has the following formula:

10



wherein R represents an alkyl group. Desirably, R has from about 1 to 8 carbon atoms, more desirably 4 carbon atoms. Desirably, the urethane is diphenylmethane diisocyanate (ICI, West Deptford, NJ).

15

The polyamines can be mixed together to form the desired physical properties. For pallets, the resulting polyurea should be rigid and exhibit a high tensile strength.

In practicing the present invention, the isocyanate and the polyamine solutions (Solution A and Solution B respectively) are mixed immediately before application to the pallet material. The mixing is done in the mixing portion of an application gun under pressure and the resulting mixture is applied uniformly to the pallet material as shown in Examples 1 and 2. The mixture that is applied to the pallet cures rapidly and results in a uniform coating. The thickness of the coating according to the present invention will vary depending upon the final physical qualities desired. The thickness of the coating is desirably between approximately 1 mil and 250 mils with a more desired thickness of between 60 and 75 mils and the

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5 most desired thickness of approximately 62.5 mils, which is approximately 1/16 of an inch.

The elastomeric coating can optionally contain additives that will provide resistance to ultraviolet radiation. Further, the elastomeric coating can optionally contain colorants added to provide a desired color.

10 The present invention is further directed to composite pallets and a method of making composite pallets. The composite pallets of the present invention comprise one or more polymeric materials optionally in combination with one or more filler materials. Suitable polymeric materials include any polymeric material capable of being formed into a polymeric board or sheet. Suitable polymeric materials include, but are
15 not limited to, polyolefins, polyesters, polyurethanes, polyureas, epoxys, polyurea-polyurethane hybrids, and combinations thereof. Desirably, the polymeric material comprises polyurea, polyurethane, or a combination thereof. More desirably, the polymeric material comprises a polyurethane foam. The filler material may be organic or inorganic filler material in the
20 form of particulate material, fibers, fabrics, rods, or any other structural reinforcement. Suitable inorganic filler materials include, but are not limited to, calcium carbonates, clays, silica, sand, glass fibers and carbon fibers. Suitable organic fillers include, but are not limited to, fibers such as
25 cotton, rayon, nylon, and other polymeric fibers, such as polyolefin fibers and aramid fibers. The amount of filler may vary as desired by one of ordinary skill in the art. In one embodiment of the present invention, filler material is added to the polymeric material in an amount ranging from about zero to 200 parts per weight of filler material per 100 parts per
30 weight of polymeric material.

The composite pallets of the present invention may be produced by any thermoforming process known to those of ordinary skill in the art. Suitable thermoforming processes include, but are not limited to, batch molding, extrusion molding, and compression molding. In one
35 embodiment in the present invention, a composite pallet is formed by placing glass fibers or fabrics in a mold with a polyurethane material and molding the pallet materials to form a high density composite panel. Desirably, the density of the composite material ranges from about 5 to about 80 pounds per cubic foot. More desirably, the density of the
40 composite material ranges from about 10 to about 40 pounds per cubic

5 foot. The composite panel is then cut into boards having dimensions similar to wooden boards of a conventional wooden pallet. The thickness, length and width of the resulting composite boards may vary depending upon the particular application. The composite boards may be adhered to one another to form a composite pallet by any means known to those of
10 ordinary skill in the art. Suitable adhesion means include, but are not limited to, nails, screws, adhesives or a combination thereof.

The present invention is further illustrated by the following examples, which are not to be construed in any way as imposing limitations upon the scope thereof. On the contrary, it is to be clearly
15 understood that resort may be had to various other embodiments, modifications, and equivalent thereto which, after reading the description herein, may suggest themselves to those skilled in the art without departing from the spirit of the present invention.

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EXAMPLE 1

A conventional pallet is formed spraying the surface of the pallet with a polyurea formulation having the following formula:

Solution A

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Rubinate [®] 9432	100%
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Solution B

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Unilink [®] 4200	5.0%
Jeffamine [®] D2000	64.0%
Ethacure [®] 100	23.0%
Jeffamine [®] T5000	8.0%

The components of solution B were mixed together 1:1 by volume with Solution A and the polymer solution (Solution A and Solution B) was
35 applied using a plural component spray machine to a thickness of approximately 62.5 mils.

EXAMPLE 2

A conventional pallet is formed spraying the surface of the
40 pallet with a polyurea formulation having the following formula:

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Solution A

Rubinate® 9432	100%
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Solution B

Unilink® 4200	3.0%
Jeffamine® D2000	65.875%
Ethacure® 100	23.125%
Jeffamine® T5000	8.0%

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The components of solution B were mixed together 1:1 by volume with Solution A and the polymer solution (Solution A and Solution B) was applied using a plural component spray machine to a thickness of approximately 62.5 mils.

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It is to be understood that the Examples herein are illustrative embodiments and that this invention is not to be limited by any of the Examples or details in the Description. Those skilled in the art will recognize that the present invention is capable of many modifications and variations without departing from the scope of the invention. Accordingly, the Detailed Description and Examples are meant to be illustrative and are not meant to limit in any manner the scope of the invention as set forth in the following claims. Rather, the claims appended hereto are to be construed broadly within the scope and spirit of the invention.

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What Is Claimed Is:

10 1. A pallet comprising one or more structural elements and an elastomeric material, wherein the elastomeric material coats or encapsulates the one or more structural elements.

15 2. The pallet of Claim 1, wherein the one or more structural elements comprise wood boards and the elastomeric material forms a uniform, monolithic, continuous coating over the wooden boards.

20 3. The pallet of Claim 2, wherein the elastomeric material comprises a polyurea, polyurethane, polyaspartics, epoxy, polyurethane-polyurea hybrids or a combination thereof.

 4. The pallet of Claim 2, wherein the elastomeric material comprises a polyurea.

25 5. The pallet of Claim 2, wherein the coating has a thickness of from about 1 mil to about 250 mils.

 6. The pallet of Claim 5, wherein the coating has a thickness of from about 60 mils to about 75 mils.

30 7. The pallet of Claim 1, wherein the one or more structural elements comprise filler materials and the elastomeric material forms a continuous matrix encapsulating the filler materials.

35 8. The pallet of Claim 7, wherein the filler material comprises particulate material, fibers, a nonwoven fabric, a woven fabric, a knitted fabric, rods, or a combination thereof.

40 9. The pallet of Claim 7, wherein the filler material comprises glass fibers, a nonwoven glass fabric, a woven glass fabric or a combination thereof.

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10. The pallet of Claim 7, wherein the elastomeric material comprises a polyurea, polyurethane, polyaspartics, epoxy, polyurethane-polyurea hybrids or a combination thereof.

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11. The pallet of Claim 10, wherein the elastomeric material comprises a polyurethane foam.

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12. A method of making the pallet of Claim 1 comprising:
spraying the wood boards with the elastomeric material to form an uniform, monolithic, continuous coating over the wooden boards.

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13. A method of making the pallet of Claim 7 comprising:
placing filler materials in a mold with an elastomeric material;
molding the materials to form a high density composite panel;
cutting the composite panel into boards; and
adhering the boards to one another to form the pallet.

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14. The method of Claim 13, wherein the boards are adhered to one another by nails, screws, adhesives or a combination thereof.

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15. An improved, waterproof, damage-resistant pallet comprising:
a wood or compressed wood pallet; and
an elastomeric material which forms an uniform, monolithic, continuous coating over the wood or compressed wood pallet.

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16. The pallet of Claim 15, wherein the elastomeric material comprises a polyurea, polyurethane, polyaspartics, epoxy, polyurethane-polyurea hybrids or a combination thereof; and wherein the coating has a thickness of from about 1 mil to about 250 mils.

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17. The pallet of Claim 16, wherein the coating has a thickness of from about 60 mils to about 75 mils.

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18. A pallet comprising:

a first plurality of composite boards in a first plane;

a second plurality of composite boards in a second plane;

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a third plurality of composite boards positioned between the first plurality of composite boards and the second plurality of composite boards; and

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attachment means for attaching the first plurality of composite boards and the second plurality of composite boards to the third plurality of composite boards; wherein the first, second and third plurality of composite boards comprise one or more filler materials and an elastomeric material which forms a continuous matrix encapsulating the one or more filler materials.

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19. The pallet of Claim 18, wherein the filler material comprises glass fibers, a nonwoven glass fabric, a woven glass fabric or a combination thereof; and wherein the elastomeric material comprises a polyurea, polyurethane, polyaspartics, epoxy, polyurethane-polyurea hybrids or a combination thereof.

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20. The pallet of Claim 18, wherein the composite boards have a density of from about 10 to about 40 pounds per cubic foot.

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21. The pallet of Claim 18, further comprising a uniform, monolithic, continuous coating over the first, second and third plurality of composite boards and the attachment means.

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22. The pallet of Claim 21, wherein the coating comprises a polyurea, polyurethane, polyaspartics, epoxy, polyurethane-polyurea hybrids or a combination thereof.

23. The pallet of Claim 22, wherein the coating comprises a polyurea.

- 5 24. The pallet of Claim 21, wherein the coating has a thickness of
from about 1 mil to about 250 mils.